

REMARKS

Information Disclosure Statement

The Office Action states that the Supplemental Information Disclosure Statement filed on December 7, 2004 fails to comply with 37 C.F.R. 1.98(a)(2). Applicant respectfully submits that the December 7, 2004 Supplemental Information Disclosure Statement did comply with 37 C.F.R. 1.98(a)(2). A copy of the submission, including the postcard showing receipt by the U.S. PTO is attached.

As shown by the postcard, a Supplemental Information Disclosure Statement, a Supplemental IDS citation and four references were received by the U.S. PTO on December 7, 2004. Further, for the two Japanese references cited, an English language abstract was provided in accordance with 37 C.F.R. 1.98(a)(3). Applicant therefore respectfully requests that the examiner consider all of the references cited in the December 7, 2004 Supplemental Information Disclosure Statement.

Specification

The specification has been amended. Specifically, the title has been amended to be indicative of the invention to which the claims are directed.

Claims

Claims 2, 3, 5, 7, 17-23, 26-28, 30, 43, 46, 47, 49-51, 53 and 56 have been canceled. Claims 64-72 were previously canceled. Claims 1, 4, 6, 8, 9, 11-16, 24, 25, 29, 31-41, 44, 48, 52, 54, 55 and 57-63 have been amended. No new matter has been added. Claims 1, 4, 6, 8, 9-16, 24, 25, 29, 31-42, 44, 45, 48, 52, 54, 55 and 57-63, are currently pending in this application.

Claims 11, 22, 35, 57 and 58 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Claims 11, 35, 37 and 58 are rejected because the term "the substrate" lacks antecedent basis. These claims have been amended to correct this informality and to clarify how the substrate relates to other elements of those claims. Claim 22 has been canceled. Accordingly, Applicant respectfully requests the withdrawal of this rejection.

Claims 1, 3, 7, 16, 17, 19, 25-27, 40 ,43, 48-50 and 63 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Loose U.S. Patent No. 6,759,641 (Loose). This rejection is respectfully traversed.

As amended, independent claim 1 recites a pixel cell comprising, *inter alia*, "a first pinned photodiode that generates charge; a second pinned photodiode that generates charge" and "readout circuitry that provides first readout signals indicating charge generated by the first pinned photodiode and second readout signals indicating charge generated by the second pinned photodiode." Amended independent claim 25 recites an image sensor comprising, *inter alia*, "an array of pixel cells, wherein at least two pixel cells each comprise: a first pinned photodiode that generates charge; a second pinned photodiode that generates charge" and "readout circuitry that provides first readout signals indicating charge generated by the first pinned photodiode and second readout signals indicating charge generated by the second pinned photodiode."

Amended independent claim 48 recites a method of forming a pixel cell comprising, *inter alia*, "forming a first pinned photodiode that generates charge; forming a second pinned photodiode that generates charge" and "forming readout circuitry that provides first readout signals indicating charge generated by the first pinned photodiode and second readout signals indicating charge generated by the second pinned photodiode."

Loose relates to an array of photodetectors coupled to addressable interface circuits. Switching circuits configure neighboring photodetectors into pixels by summing the outputs into an aggregated pixel signal. Loose at col. 2, lines 14-25. Loose, however, is silent about a pixel cell having first and second pinned photodiodes and a method of forming such a pixel. Additionally, Loose is silent about a pixel having “readout circuitry that provides first readout signals indicating charge generated by the first pinned photodiode and second readout signals indicating charge generated by the second pinned photodiode,” as recited by claims 1 and 25; and method of forming a pixel having such circuitry as recited by claim 48. Instead, Loose’s pixels provide signals indicating the sum of the charge on multiple photodetectors. Loose at col. 3, line 10 to col. 4, line 47. For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 1, 3, 7-12, 16, 17, 19-22, 25-27, 32-36, 40 ,43, 48-50, 55-59, 62 and 63 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Kochi U.S. Patent No. 6,947,088 (Kochi). This rejection is respectfully traversed.

Kochi relates to a small sized image pickup element. To achieve the small size, Kochi discloses that the image pickup element includes a plurality of pixel blocks each having a plurality of photoelectric conversion elements and a plurality of transfer switches for transferring signals from the respective photoelectric conversion elements. Each pixel block has a common amplifier for receiving signals from the transfer switches. Kochi at col. 1, lines 41-52.

In addition to the limitations noted above, claims 1 and 25 further recite “a first transistor between the first and second pinned photodiodes for transferring charge generated by the first pinned photodiode to the second pinned photodiode.” Claim 48 further recites “forming a first transistor between the first and second pinned

photodiodes for transferring charge generated by the first pinned photodiode to the second pinned photodiode."

Kochi, however, fails to disclose all limitations of any of independent claims 1, 25 and 48. Kochi is silent about the photoelectric conversion elements being pinned photodiodes. Further, Kochi's switches are configured to transfer charge from each photoelectric conversion element in a pixel block to a same floating diffusion region. Kochi at col. 3, lines 17-24. Kochi's floating diffusion region is not configured to generate charge, nor is it a pinned photodiode. Therefore, Kochi does not anticipate any of independent claims 1, 25 and 48. For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 1, 3, 5, 7-12, 16, 17-28, 30, 32-36, 40 ,43, 48-53, 55-59, 62 and 63 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Takahashi U.S. Patent No. 5,955,753 (Takahashi). This rejection is respectfully traversed.

As amended, independent claim 24 recites a pixel cell comprising, *inter alia*, "a first pinned photodiode that generates charge in response to light; a second pinned photodiode that generates charge in response to light and receives charge transferred from the first pinned photodiode" and "a first transistor coupled to the first and second pinned photodiodes for transferring charge generated by the first pinned photodiode to the second pinned photodiode."

Similarly to Kochi, Takahashi relates to a small sized image pickup apparatus. Like Kochi, to achieve the small size, Takahashi discloses that a single floating diffusion region and a single source-follower amplifier are common to multiple photoelectric converting devices. Each photoelectric converting device is connected to

the floating diffusion region through a MOS transistor switch. Takahashi at col. 2, lines 36-48.

Takahashi, however, fails to disclose all limitations of any of independent claims 1, 24, 25 and 48. Takahashi's MOS transistor switches are configured to transfer charge from a photoelectric conversion element to a floating diffusion region. Takahashi at col. 4, lines 36-47. Takahashi's floating diffusion region is not configured to generate charge, nor is it a pinned photodiode. Therefore, Takahashi does not anticipate any of independent claims 1, 24, 25 and 48. For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 1, 3, 4, 7-9, 16, 17, 19, 20, 22, 25-27, 29, 32, 33, 40, 43, 48-50, 52, 55, 56 and 63 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Barna et al., PCT Application Publication No. WO 00-78034 (Barna). This rejection is respectfully traversed.

Claims 25, 41, 44 and 46 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Suzuki U.S. Patent No. 4,819,074 (Suzuki). This rejection is respectfully traversed.

As amended, independent claim 44 recites a processor system comprising, *inter alia*, "an array of pixel cells, wherein at least two of the pixel cells each comprise: a first pinned photodiode that generates charge; a second pinned photodiode that generates charge" and "a first transistor between the first and second pinned photodiodes for transferring charge generated by the first pinned photodiode to the second pinned photodiode."

Suzuki fails to disclose all limitations of either of independent claims 25 and 44. Suzuki discloses a MOS type image sensor having picture cells, each including a photodiode connected to a vertical drain line by a MOS transistor. The light shield over the picture cells has an opening allowing light to reach the photodiode and the MOS transistor. Suzuki, however, is silent about a pixel having first and second pinned photodiodes or a method of forming such a pixel. Accordingly, Suzuki does not anticipate claims 25 and 44. For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 6, 31 and 54 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi. This rejection is respectfully traversed.

As discussed above, Takahashi does not disclose, teach or suggest all limitations of independent claims 1, 25 and 48, from which claims 6, 31 and 54 respectively depend. Any routine skill in the art for choosing pinning voltages for Takahashi's photoelectric conversion elements would not supplement the deficiencies of Takahashi. For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 13-15, 37-39, 60 and 61 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over either one of Takahashi or Kochi. This rejection is respectfully traversed.

As discussed above, neither Takahashi nor Kochi disclose, teach or suggest all limitations of independent claims 1, 25 and 48, from which claims 13-15, 37-39, and 60-61 depend. Even assuming the Office Action could show a particular doped well configuration and a motivation for modifying either Takahashi or Kochi with such coped well configuration, the deficiencies of Takahashi and Kochi would still not be

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overcome. For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 45 and 47 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Suzuki. This rejection is respectfully traversed.

Claim 47 has been canceled. As discussed above, Suzuki fails to disclose, teach or suggest all limitations of independent claim 44 from which claim 45 depends. Any knowledge of CDS by those skilled in the art at the time the invention was made would not supplement the deficiencies of Suzuki. For at least these reasons, withdrawal of this rejection is respectfully requested.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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